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- A2 21. (AMENDED) A method for producing cellulose-degrading enzymes comprising cultivating a genetically recombinant plant according to Claim [1] 16.
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- A3 26. (AMENDED) A method of ensilement comprising ensiling a plant according to Claim [13] 16, whereby cellulose-degrading enzymes produced by the plant increase nutritional value of silage.
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REMARKS

Claims 1-15 and 23-25 have been canceled herein. Such cancellation is without prejudice on the merits to further prosecution of these claims in one or more continuing applications.

Claims 16, 21, and 26 have been amended herein.

Claims 16-22 and 26 remain in the case. Favorable reconsideration is respectfully requested.

**Rejection of Claims 1-26 Under 35 USC §112, Second Paragraph:**

As applied to Claims 1-15 and 23-25, this rejection has been obviated by cancellation of the claims.

As applied to Claim 16 and the claims dependent thereon, this rejection is believed to have been overcome by appropriate amendment Claim 16, in accordance with the Examiner's recommendation. Specifically, the phrase "and combinations thereof" has been removed from Claim 16.

Withdrawal of the rejection of Claims 1-26 under 35 USC §112, second paragraph is now respectfully requested.

**Rejection of Claims 1-13, 15, and 21-24 Under 35 USC §102(e) Over Van Ooyen et al.,  
U.S. Patent No. 5,705,375:**

As applied to Claims 1-13, 15, 23, and 24, this rejection has been obviated by cancellation of the claims.

As applied to Claims 21 and 22, this rejection is believed to have been overcome by amendment to Claims 21 and 22. As amended, Claims 21 and 22 now depend from Claim 16, a claim not subject to this rejection. For the Examiner's convenience, Claims 16 (the base claim), 21 and 22 now read as follows:

16. A genetically recombinant tobacco or alfalfa plant, which is stably transformed to contain and express a gene sequence which encodes a cellulase-degrading enzyme selected from the group consisting of *T. fusca* cellulase E2, *T. fusca* cellulase E3, *T. reesei* CBH I, and *A. cellulolyticus* endoglucanase E1.
21. A method for producing cellulose-degrading enzymes comprising cultivating a genetically recombinant plant according to Claim 16.
22. The method of Claim 21, further comprising concentrating the cellulose-degrading enzymes.

The reference to Van Ooyen et al. also does not render obvious either of Claims 21 and 22 because the reference does not describe or suggest how to transform a tobacco or alfalfa plant to express any of the enzymes recited in Claim 16, namely *T. fusca* cellulase E2, *T. fusca* cellulase E3, *T. reesei* CBH I, and *A. cellulolyticus* endoglucanase E1. In fact, the only portion of the Van Ooyen et al. reference that provides a complete disclosure of the invention described therein begins in the Examples, starting at column 9, line 63. These examples describe the transformation and expression in plants of the  $\alpha$ -amylase gene from *B. licheniformis* and the glucoamylase gene from *A. niger*. In short, this reference does not render obvious either of Claims 21 or 22 because the reference does provide to the person of ordinary skill in the art sufficient information to arrive at the claimed invention.

Moreover, with respect to Claim 22, the Van Ooyen et al. reference neither anticipates nor renders obvious this claim because the reference is totally silent regarding concentrating the cellulose-degrading produced in the host plant.

For at least these reasons, it is respectfully submitted that the rejection of Claims 21 and 22 in view of Van Ooyen et al. is no longer tenable. Withdrawal of the rejection is respectfully requested.

**Rejection of Claims 14, 16-18, and 25-26 Under 35 USC §103(a) Over Van Ooyen et al., in View of Virki et al. (WO 93 20714 A), Henrissat et al. (Bio/Technology 3:722-726), and Willmitzer et al (WO 92 01042):**

As applied to Claims 14 and 25, this rejection has been obviated by cancellation of the claims.

As applied to Claims 16-18 and 26, this rejection is respectfully traversed.

Applicants' undersigned representative thanks the Office for candidly acknowledging that the Van Ooyen et al. reference does not describe genetically-engineered plants expressing *T. fusca* cellulase E2, *T. fusca* cellulase E3, *T. reesei* CBH I, and *A. cellulolyticus* endoglucanase E1. It is respectfully submitted that combining the primary reference to Van Ooyen, with Virki et al., Henrissat et al., and/or Willmitzer et al. (alone or in any combination with the primary reference) does not cure the shortcomings of the Van Ooyen reference.

With regard to the Virki et al. reference, this reference is unrelated to the present claims. The Virki et al. reference does not describe in any fashion the production of cellulose-degrading enzymes. The Virki et al. reference does not describe the transformation of plant hosts to express any type of cellulose-degrading enzymes (or any other protein for that matter). The Virki et al. reference does not describe transforming tobacco or alfalfa to contain and express genes that encode *T. fusca* cellulase E2, *T. fusca* cellulase E3, *T. reesei* CBH I, and *A. cellulolyticus* endoglucanase E1, the enzymes explicitly recited in Claim 16. Also, contrary to

the implication made in the Office Action at page 4, 4<sup>th</sup> line from the bottom, the Virki et al. reference does not mention transforming a plant host to express CBH I, CBH II, or EG I.

The disclosure of Virki et al. is limited to a description of the chromatographic fractionation of commercially-obtained cellulase mixtures. These commercially-available enzyme mixtures just happen to contain CBH I, CBH II, or EG I. This, however, is irrelevant to the present claims because Applicants are not claiming the enzymes themselves; Applicants are claiming an alfalfa or tobacco host transformed to express these enzymes. Example 1 of the Virki et al. reference is illustrative. The Example describes the chromatic fractionation of Cytolase-123-brand enzyme (from Genencor). Cytolase-brand enzyme is produced by a genetically-engineered *microorganism*, not by a genetically-engineered *plant*. Confirmation of this fact can be had by contacting the Research & Development Department of Genencor International, Inc. 925 Page Mill Road, Palo Alto, CA 94304, Tel: 650-846-7500.

Thus, the Virki et al. patent is irrelevant to the present claims. The reference simply does not address in any fashion the use of cellulose-degrading enzymes manufactured in recombinant plant hosts. The Virki et al. reference describes nothing more than the fractionation of conventional and commercially available cellulase mixtures into their component enzymes. Thus, combining Virki et al. with the Van Ooyen et al. reference does not cure the acknowledged shortcomings of the Van Ooyen reference.

Likewise, the teaching of the Willmitzer reference also fails to add any further relevant disclosure to that provided by both of Van Ooyen et al. and Virki et al. While Willmitzer admittedly contains a sweeping, wholly unsupported and non-enabling discussion of enzymes that could *possibly* be expressed in plants, the reference only provides the most basic protocol for expressing two enzymes in a transgenic plant: rennilase and chymosin. As to expressing the other enzymes mentioned in the Willmitzer reference, the disclosure is silent. In short, combining Willmitzer with Van Ooyen et al. and Virki et al. does not yield the present invention because Willmitzer is completely silent regarding expressing any of *T. fusca* cellulase E2, *T. fusca* cellulase E3, *T. reesei* CBH I, and *A. cellulolyticus* endoglucanase E1 in

an alfalfa or tobacco host. The ability to express rennilase and/or chymosin in a plant host does not render obvious the present claims because rennilase and chymosin are completely unrelated to any of the enzymes recited in Claim 16. The combined teaching of these three references thus fails to enable the production of a transformed alfalfa or tobacco plant as recited in Claim 16.

Combining Van Ooyen et al, Virki et al., and Willmitzer with Henrissat also does not teach or suggest the present invention because Henrissat, like Virki et al. is concerned with the synergy of conventional cellulose mixtures derived from microorganisms, not transformed plants. The Henrissat reference is totally silent regarding transformed plants that express any type of cellulose-degrading enzyme.

Further still, the Office is not free to disregard the contrary teachings of the applied references. The Office's stated reason for relying on Henrissat is that it teaches the (presumably) desirable synergism of cellulose mixtures. However, this motivation is directly contradicted by the teaching of Virki et al. The entire drive of the Virki et al. work is summed up in the first paragraph of the Summary of the Invention in Virki et al:

It has not been surprisingly found that the adverse effects of the commercial products are caused by the presence of certain enzyme combinations in the commercial grade cellulases used in said products.

So which is it? Virki et al. teach that it is undesirable to combine cellulases, and therefore describes a means to fractionate such mixtures into their component enzymes, while the Office cites Henrissat as somehow being relevant to the presently claimed invention because combining cellulases is, according to Henrissat, desirable.

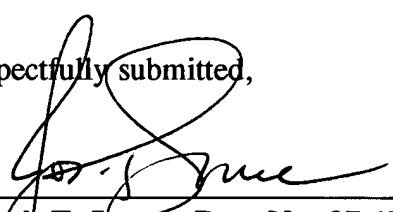
The bottom line is that Henrissat adds nothing to the combined disclosure of Van Ooyen et al, Virki et al., and Willmitzer because Henrissat is completely and totally silent regarding an alfalfa or tobacco host that has been transformed to express any of *T. fusca* cellulase E2, *T. fusca* cellulase E3, *T. reesei* CBH I, and *A. cellulolyticus* endoglucanase E1.

Thus, it is respectfully submitted that the rejection of Claims 16-18 and 26 under §103(a) in view of Van Ooyen et al, Virki et al., Willmitzer, and Henrissat, taken individually or in any combination, is improper. Withdrawal of the rejection is now requested.

### CONCLUSION

In light of the above remarks, Applicants submits the application is now in condition for allowance. Early notification of such action is earnestly solicited. The Commissioner is authorized to charge any fees or credit any overpayments relating to this application to deposit account number 18-2055.

Respectfully submitted,

  
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**Joseph T. Leone, Reg. No. 37,170**  
**DEWITT ROSS & STEVENS, S.C.**  
Firststar Financial Centre  
8000 Excelsior Drive, Suite 401  
Madison, Wisconsin 53717-1914  
Telephone: (608) 831-2100  
Facsimile: (608) 831-2106

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appln. Serial No.: 09/373,272

Group Art Unit: 1635

Filing Date: August 12, 1999

Examiner: Epps, J.

Applicant(s): Austin-Phillips et al.

Attorney Docket No.: 09820.114

Title: **TRANSGENIC PLANTS AS ALTERNATIVE SOURCE OF  
LIGNOCELLULOSIC-DEGRADING ENZYMES**

**"CLEAN" CLAIMS AS AMENDED, 37 CFR §1.121(c)(1)(i)**

16. (AMENDED) A genetically recombinant tobacco or alfalfa plant, which is stably transformed to contain and express a gene sequence which encodes a cellulase-degrading enzyme selected from the group consisting of *T. fusca* cellulase E2, *T. fusca* cellulase E3, *T. reesei* CBH I, and *A. cellulolyticus* endoglucanase E1.
17. The genetically recombinant plant of Claim 16, which is alfalfa.
18. The genetically recombinant plant of Claim 16, which is tobacco.
19. The genetically recombinant plant of Claim 16, which is alfalfa transformed to contain and express a gene sequence selected from the group consisting of SEQ. ID. NOS: 8 and 9.
20. The genetically recombinant plant of Claim 16, which is tobacco transformed to contain and express a gene sequence selected from the group consisting of SEQ. ID. NOS: 8 and 9.

21. (AMENDED) A method for producing cellulose-degrading enzymes comprising cultivating a genetically recombinant plant according to Claim 16.
22. The method of Claim 21, further comprising concentrating the cellulose-degrading enzymes.
26. (AMENDED) A method of ensilement comprising ensiling a plant according to Claim 16, whereby cellulose-degrading enzymes produced by the plant increase nutritional value of silage.



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LIGNOCELLULOSIC-DEGRADING ENZYMES**

**"MARKED UP" CLAIMS AS AMENDED, 37 CFR §1.121(c)(1)(ii)**

16. (AMENDED) [The] A genetically recombinant [plant of Claim 15] tabacco or alfalfa plant, which is stably transformed to contain and express a gene sequence which encodes a cellulase-degrading enzyme selected from the group consisting of *T. fusca* cellulase E2, *T. fusca* cellulase E3, *T. [ressei]* reesei CBH I, and *A. cellulolyticus* endoglucanase E1[, and combinations thereof].
17. The genetically recombinat plant of Claim 16, which is alfalfa.
18. The genetically recombinant plant of Claim 16, which is tobacco.
19. The genetically recombinant plant of Claim 16, which is alfalfa transformed to contain and express a gene sequence selected from the group consisting of SEQ. ID. NOS: 8

and 9.

20. The genetically recombinant plant of Claim 16, which is tobacco transformed to contain and express a gene sequence selected from the group consisting of SEQ. ID. NOS: 8 and 9.
  21. (AMENDED) A method for producing cellulose-degrading enzymes comprising cultivating a genetically recombinant plant according to Claim [1] 16.
  22. The method of Claim 21, further comprising concentrating the cellulose-degrading enzymes.
  26. (AMENDED) A method of ensilement comprising ensiling a plant according to Claim [13] 16, whereby cellulose-degrading enzymes produced by the plant increase nutritional value of silage.
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